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Technician Work placement report– summer 2009

Multimedia Automatic Vehicle Location

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Tasks table

NAME	DESCRIPTION	TYPE	LOCATION

About the company Hanover display ltd	Find the information necessary for the proper conduct of the internship	Research	P 8-10
Information process	Processing of the presentation of information supplied by the customer	Software	P 11-12
MP3 link	Create MP3 link for each stop	Software	P 13-14
Test board visio	Drawing the plan	Software	P 15-21
Hancis power control	Setting time values and Testing	Hardware	P 22-25
TC-65 Wireless module	Investigation of faulty module	Hardware	P 26-29
Test board	Fixing and wiring of devices needed for test	Hardware	P 30-32

INTRODUCTION

This two-month training, which concluded my second year engineering school, was performed at Hanover Displays Ltd (Great Britain) in their MAVL department.
As engineer's duties might involve the supervision of technicians, this internship dealt with technician work.

For the need of the company, several tasks have been realised.
Each task is of equal importance and no one single task is important enough to be presented alone. Consequently this report will deal with several projects that were finalised during my training.
The MAVL department works as much on the hardware part as on the software part, this is the reason why we can find hardware and software tasks.
Each task will be described and the solution to carry out this task will be given.

CHAPTER 1: ABOUT THE COMPANY HANOVER DISPLAY Ltd

.1 Company Profile

Hanover Displays Ltd is Europe's leading manufacturer of electronic destination signs for the public transport industry. Established in 1985, the company has consistently grown and developed, continually refining its product range to meet the specific demands of customers.
Hanover is an ISO 9001 and ISO 14001 certified company. Its Head office and major production facility is based in Lewes, England.
The company has recently opened a production unit in Chicago USA.
It has sales and service centres at various locations around the world to provide local support to all customers.The company also has its own subsidiary in France, Italy, Spain, Australia, and USA and most recently in Denmark supporting the Scandinavian market.

1.2. Factory

The factory has approximately 33,000 sq ft of floor space which includes production, administration, sales, engineering, research and development. Hanover currently employs about 70 full time production staff producing up to 3,000 units per month on a single shift. If required, Hanover can run double shifts to ensure delivery times are always maintained.

1.3. Company Products

There are well over 250, 000 Hanover destination displays installed on public transport vehicles around the world.
Hanover provides a complete range of display signs for front, side, rear and interior positioning, which fit all currently available bus and coach models.

The company also supplies Global Positioning Systems, Voice Announcement Systems, Wireless Data Transfer Systems, Multi-media On-bus Passenger information Display, as well as, street-based displays.
You can find the main products that I had to deal with during my internship below:

Interior LED signs

Provide on-board passenger information such as:
- Advertising Messages
-Next Stop information,
-Bus Stopping

Sign controllers ERIC and DERIC

.

controller, which provide the driver with easy to use facilities for selecting the required destination, the Eric+ & Deric+. As well as storing the destination database and sending messages to the signs, the controllers can also monitor the performance of the displays

Hancis AVC

The Hancis product group has been developed to provide a robust centralised computer system powerful enough to operate multi-media screens . The Hancis AVC (Audio Visual Computer) provides the operator with video, audio & GPS

within a single unit and can be placed anywhere within the vehicle.
Notice : It exists also The Hancis AOC (Audio Only Computer)

Multimedia flat screen

Hanover's Multimedia Displays bring a new standard in display quality and functionality to on-bus passenger information. These displays are based on bright high-resolution TFT flat panels driven by a powerful multi-media processor capable of processing rich graphic images and real-time full-screen video and audio. They offer significant potential for generating revenue through advertising.

Keylo portable loader

The Keylo has been developed to make the process of transferring destination lists to vehicle based sign controllers more convenient. Previously, an ERIC+ or DERIC+ sign controller, configured as a Data Loader, was used to transfer the data from the PC to the sign controller. The Keylo offers the additional advantages that it is small, portable, and robust and fits easily into the user's pocket. In addition no transfer cable is required.

CHAPTER 2: SOFTWARE PROJECT

.1 Task 1 :Information process

DESCRIPTION	FILE SUPPLIED	IT SKILLS NEEDED

The goal of This project is: re-create a stop list from the set of routes that the customer has provided so as to optimize the list and simplify the work to be done with this list. All the stops need to be contained in a single page Some routes contain the same stops. The duplicate have to be deleted. I also need to create the list of the inconsistencies stops (see step 6 below) and send the list to the customer. Then the customer should provide us a single set of stop names and voice text.	spread sheet excel “original.xls” This file contains the different routes that the train can take. Each route is contained in a different page. Each route is associated with several stop. Each stop is associated with the id stop (number), the description (name of the stop), the latitude and longitude (position) and the voice (announcement)	Microsoft Excel 2003 and 2007

2.1.1. Manipulation

Notice: This part is about one solution to do this work, however other solutions probably exist.

Step 1: create a new column : “Duplicate 1“and “duplicate 2”

Step 2: Make sure that the latitude of each information has the same size (the same number of decimal after the coma) to avoid any incomprehension with the software Excel.
Else do the following step: -> select column -> click right -> format cell number -> chose the decimal

Step 3: test first if some information has a duplicate (i.e. each column is the same)
enter the following calculation In the first line of the column "duplicate 1":

And(A3=A2 , B3=B2, C3=C2……..E3=E2)

Copy this line on all of the line of "duplicate1" (this calculation returns true if the condition is full and false if not.

Step 4: Copy the result of the column "duplicate1" on the "duplicate 2".

Right click on "duplicate1" and do the following step: ->copy -> click right on "duplicate2" ->paste special->value

Step 5: sort the column "duplicate2" and delete all informations that are true

Notice: As part of this process we have found a number of inconsistencies. Indeed, some stops have different stop names or different voice text for the same stop ID.

Step 6: Highlight information that can have a problem. For example : the same stop but different voice or the same number and different description.
Below, an example of a duplicate number but not the same voice or the same description:
enter in the column "duplicate1" the following calculation (the previous calculation can be deleted:

Or (And(A3=A2 , B3=B2),And(A3=A2 , E3=E2), And(A2=A3 , B2=B3),And(A2=A3 , E2=E3)

Highlight the reply “true “

Step 7 : send to the customer and wait for the return. Replace the information highlighted by the information he wants

The illustration of the main steps can be found on the annex “information process : manipulation”

2.2 Task 2: MP_3 link

DESCRIPTION	F I L E SUPPLIED	IT SKILLS NEEDED

Create an empty mp3 file for every stop. ie if there are 5 stops with ID's of 1,2,3,4,5 i would need to create 5 mp3's named 1.mp3, 2.mp3, 3.mp3, 4.mp3, 6.mp3.	List of stops	Microsoft Excel 2003 and 2007 File "copy and rename. Bat"

2.2.1 Research of a solution

Find the best application to create automatically "n" file with a text document that contain "n" stop and for which the name of the first file is the name of the first stop , the name of the second file is the name of the second stop,……
The batch file "copy and rename" seems to be suited with this work. The content of the directory is the following:

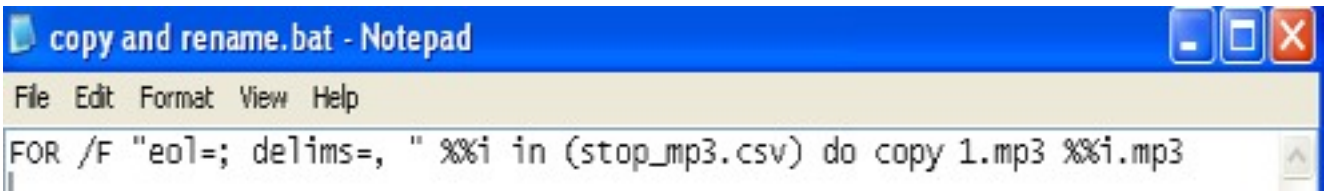
See "research of a solution for the MP3 link" on annex

Notice: The stop_mp3.xls is the file that contains every stop. It must be converted to csv extension.

2.2.2 : Manipulation

Edit the file :
Right click and Edit

Then adapt the code with your need



Notice: the Mp3 extension can be changed by other extensions like doc or ppt for example.

Execution:

Open the file “copy and rename.bat.” Then you can see the following screen:

See “MP3 link execution 1” on the appendix

After execution, a part of the content of the directory “copyAndRenamesFiles” is the following:

See “MP3 link: execution 2” on the appendix

2.3. Task 3: Test board

Description	File supplied	IT skills needed

create a test board for the MAVL department	No file supplied	Microsoft Office Visio 2007

.1 About Microsoft Office Visio 2007

Microsoft Office Visio 2007 is the market-leading diagramming software for business and IT professionals. Visio 2007 enables facility management professionals to easily and effectively visualize, explore, and communicate facility information. Facility managers can use Visio 2007 to map office layouts, visualize and track asset data, and communicate facility information.
Microsoft Office Visio 2007 provides you with more than sixty model diagrams and thousands of forms, some simple, others more complex. Each model has a separate objective, ranging from plans of plumbing to IT networks.
The Visio object model exposes many classes that you can use to create diagrams, flow charts, the chronology of a project, network diagrams, office space, etc.

.1 Measurement

Name	Width (mm)	Height(mm)
wooden support	1820	1200
AVC / AOC/HTC*/ HTCA*	275	188
Internal sign	675	125
Slave flat screen	560	330
switch box	110	70
VS001	210	107
KVM	180	115
ERIC	138	89
DERIK	94	47
HUB	82	67

.2 Skills needed

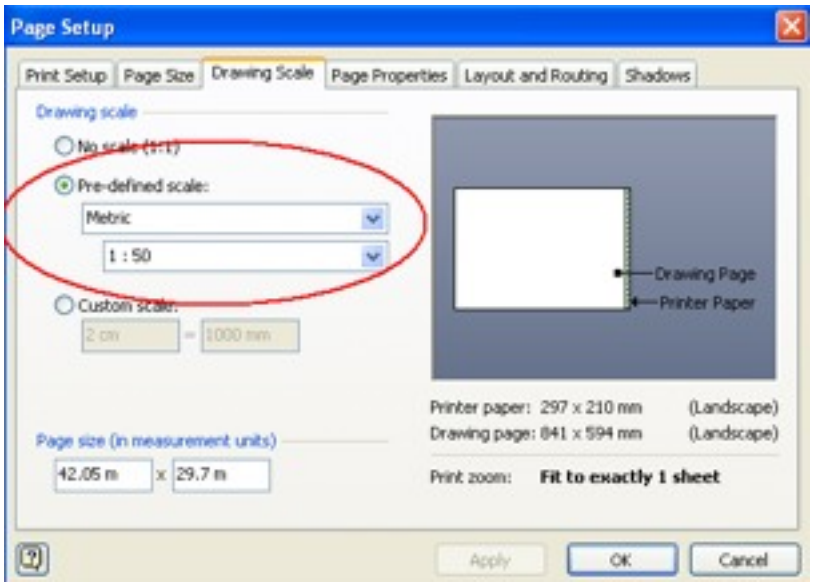
This task needs some knowledge of Microsoft Office Visio 2007. The know ledges needed are given below.

Change the drawing scale

When the drawings contain real-world objects that are larger than the printed page, such as the furniture in an office, you need to draw to scale. The drawing scale determines how a distance on the page represents a distance in the real world. For example 2 centimetres might represent 1 meter.____

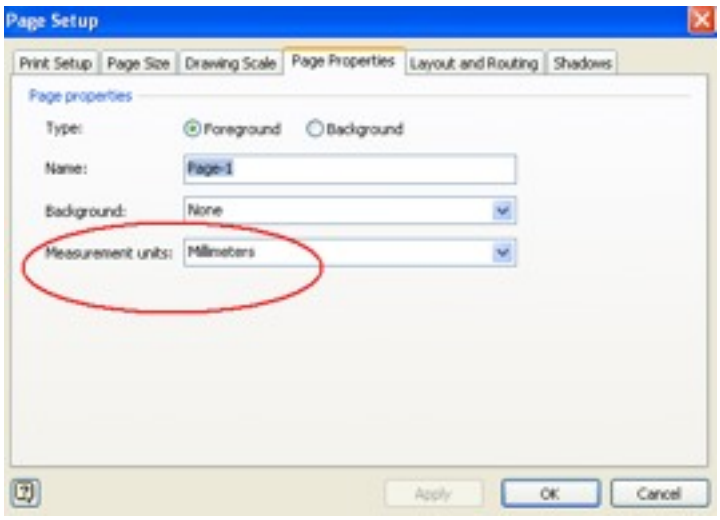
On the **File** menu, click **Page Setup**, and then click the **Drawing Scale** tab.

Click **Pre-defined scale**, and then click a pre-defined architectural, metric, or engineering scale; or click **Custom Scale** and type a custom scale.



To change the measurement units (such as feet or meters), click the **Page Properties** tab, and in the **Measurement units** list, click the units that you want.

Click **Apply** to save your changes and update the drawing page.

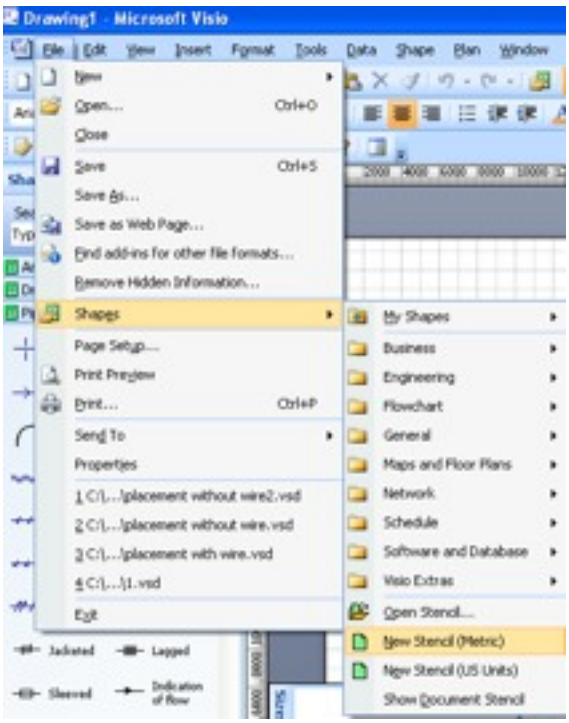


Create a shape

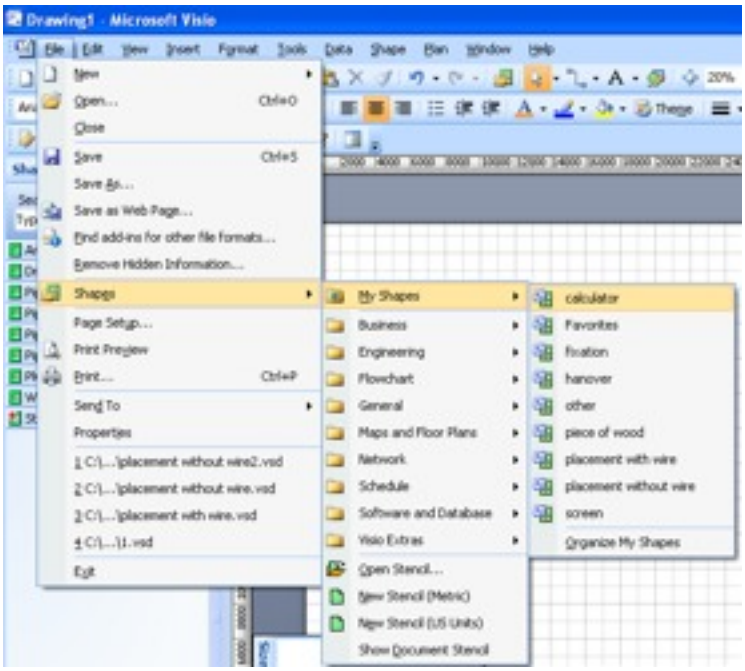
You can create your own custom shapes and add them to an editable stencil. Your **Favorites** stencil and custom stencils that you create are editable. The stencils provided with Visio templates are not.

Open a new stencil, your **Favorites** stencil, or a custom stencil that you created.

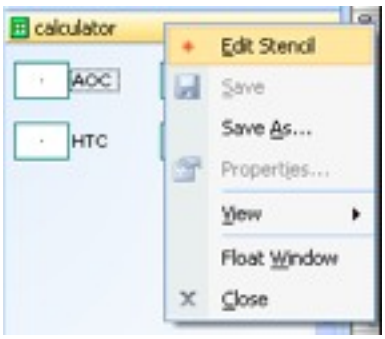
To open a new stencil, on the **File** menu, point to **Shapes**, and then click **New Stencil**.



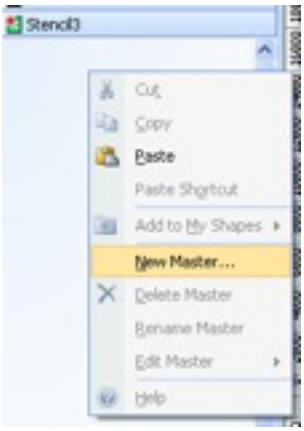
To open a custom stencil, on the **File** menu, point to **Shapes**, point to **My Shapes**, and then click the name of the stencil.



If the stencil is not editable, right-click the stencil title bar, and then click **Edit Stencil**.

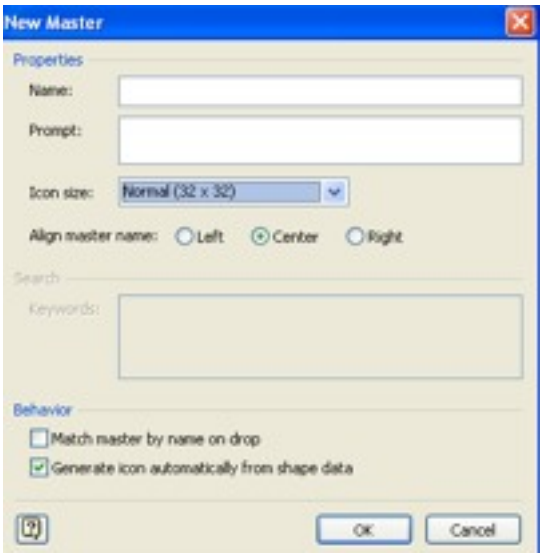


Right-click the stencil window, and then click **New Master**.



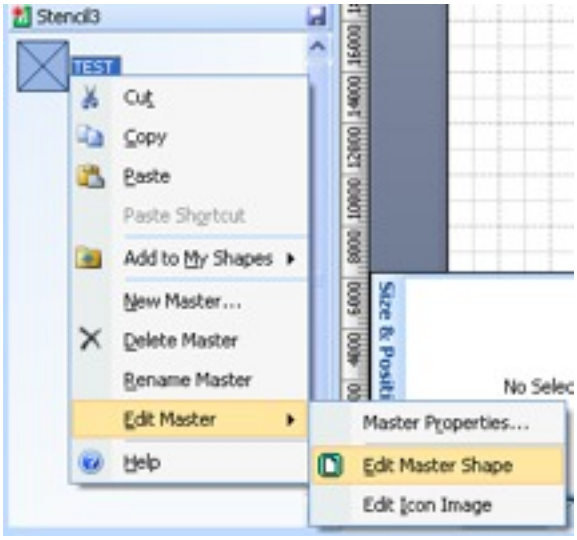
In the **New Master** dialog box, specify characteristics for the shape.

Click **OK**.



A blank shape icon appears in the stencil.

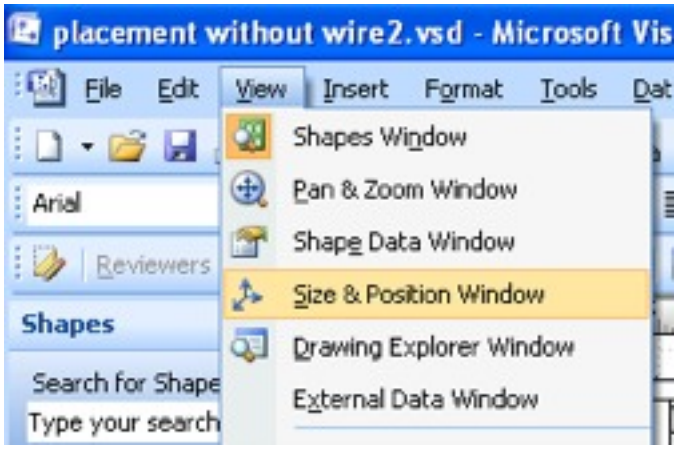
Right-click the new shape, point to **Edit Master**, and then clicks **Edit Master Shape**.

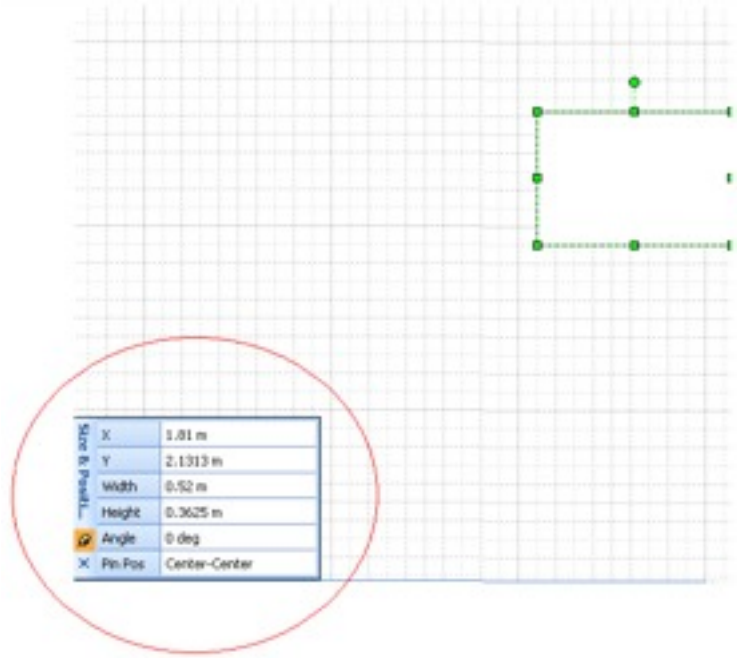


Measure shapes

There are five different ways to measure shapes in Microsoft Office Visio 2007. Which way is best depends on the type of measurements that you need and whether you want to display the measurements in your drawing.
This task requires the easiest way that is presented below:

In the View menu, click Size and position window





Notice: the position x and y can be very useful to move carefully a shape.

2.3.4. Drawing

This drawing shows the plan realized with the software Microsoft Office Visio 2007.
This plan allows drawing precisely the position of each electronic device and between each electronic device that allow avoiding making mistakes during the implementation.

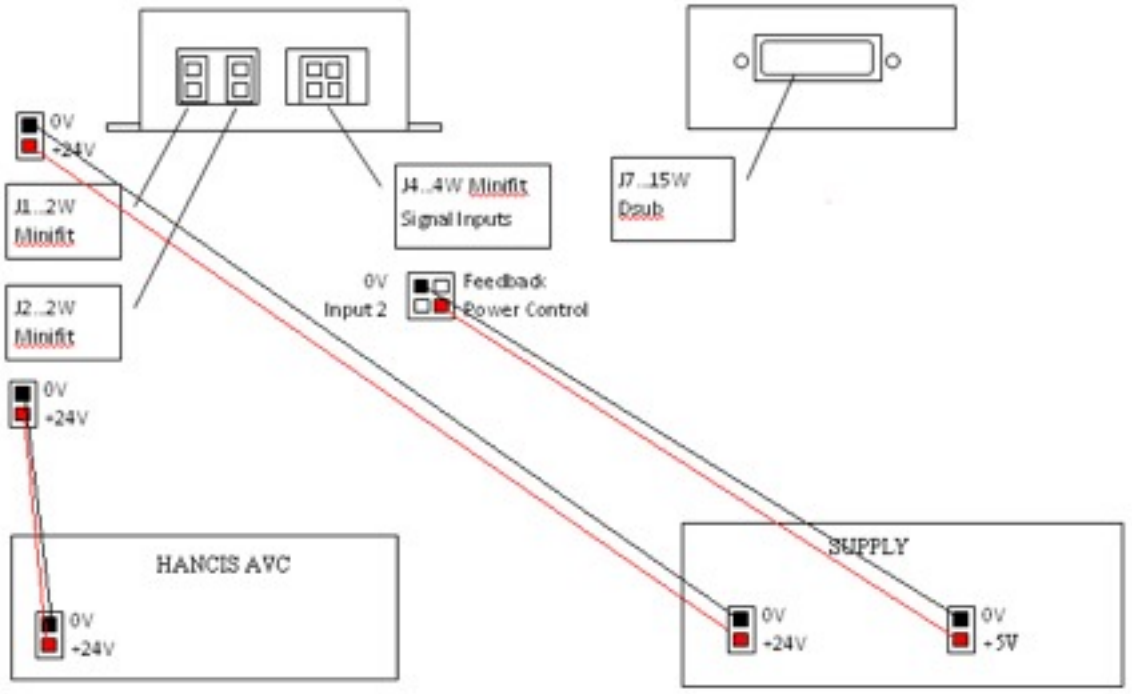
The plan is presented on the annex “drawing test board with measure” and “drawing test board without measure”.

CHAPTER 3: HARDWARE TASKS

3.1 Task 1: Hancis power control.

DESCRIPTION	FILE SUPPLIED	TOOLS NEEDED
The “Power Controller” that has been designed by an engineer of the company must be setup and tested in a mode where it is connected to permanent 24V power and ignition switch to the control input. When ignition is switched on it must switch on. When ignition switches off it must turn off after 2 hrs.	User manual Master.exe 7692test.msg	Multimeter voltage generator screw driver connector crimp electric wire

3.1.1 Connecting (i.e. the ignition, the supply and the serial port) and running the board



Notice: The main supply is 24v

In this diagram:

- Power control = ignition;
- the ignition supply is from 3v to 40v.
- The position of the link 3 must be A for testing (see p.8 of the datasheet)
- The position of the link 3 must be B for setting a value (see p.8 of the datasheet)

.1 Manipulation

checking the interface

The step are as follows :

- Put the file Master.exe and 7692test.msg in the disk C (for example)
- In the monitor enter the following command
  - "Cd c:\ " to access at the disk C
  - "MASTER –C1 7692test.msg" to open the file Master.exe avec le port COM 1
  - "7692test.msg" to open the file 7692test.msg

The illustration of the monitor can be found on the appendix "cheking the interface for the Hancis power control".

adjust the value for testing

Open the file 7692test.msg with note pad

The illustration of the contents of the file can be found in the annex "Hancis power control: adjust the value for testing"

CODE	
!ECHO \t1. Set Delay to 90 Minute	the text display on the command prompt `1. Set Delay to 90 Minute`

!LABEL(1) "90S10,90" ! PAUSE !GOTO(start)	- The S is for Set a value
	- The 90 is the value 90 in minutes
	`.90S10,90.4B`
	`.90S090.A4`

!LABEL(4) "90G10" !GOTO (start)	G is used to get a value. It allows to check if the values set have been taken into account by the power control
	`.90G10.EC`
	`.90G090.B0`

!LABEL(5) "90" !GOTO(start)	90 allows us to check the version of the software
	The reply can be the following:
	`.90.94`
	`.90PCC V1.01.84`

3.1.3 Progress report

TEST	OBSERVATION	RESULT
Power supply	the LED of the board is solid red	power supply ok
Ignition switch on	LED of the board flashes green during 5 seconds (Waiting for the first feedback) and solid green after.	ignition supply ok
Ignition switch off test 1	the ignition has been tested for 1 minute	ignition switches off after 1 minutes ok
Ignition switch off test 2	the ignition has been tested for 120 minutes	ignition does not switch off after 120 minutes
Ignition switch off test 3	the ignition has been tested for 59 minutes	ignition switches off after 59
Ignition switch off test 4	the ignition has been tested for 61 minutes	Ignition does not switch off after 61 minutes
verification of the software version	The version is V1.01.84	Version corrected

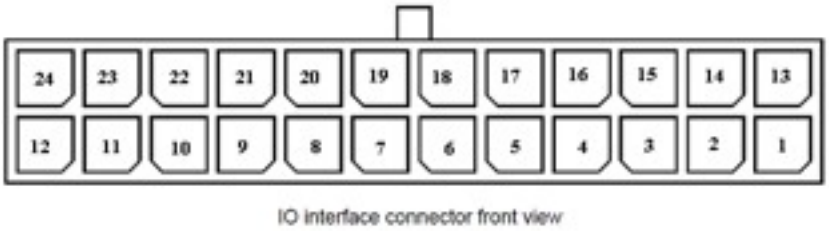
Ignition switch off test 5	the ignition has been tested for 120 minutes after correction of the software	Ignition switches off after 120 minutes

2. Task 2: TC-65 Wireless module.

DESCRIPTION	FILE SUPPLY	TOOLS NEEDED
The TC65 is a high performance open-platform module, which features a fully-fledged software developer's platform based on Java™. The Company mainly uses this module for the data transmission The task consists in investigating some module damaged.	No documentation supplied because this module is not realised by Hanover Displays. The software interface description as well as the terminal description can be found thanks to internet but we can access to the schematic.	multimeter voltage supply screw driver connector crimp electrical wire RS 232 cable

3.2.1. Power supply of the module

According to the document" Hardware interface description V1" the pin connectors are the following :

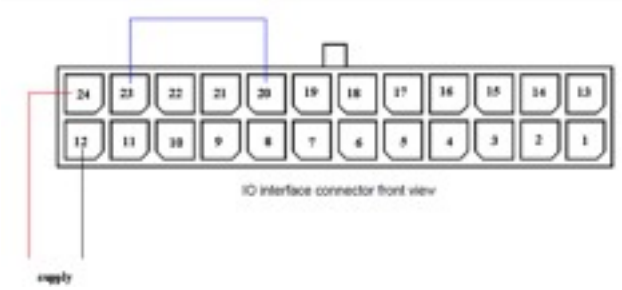


IO interface connector front view

The table with the signal name of each pin and the description of each signal can be found on the annex "table pin for the power supply TC-65 Wireless module"

Notice : The ON-OFF pin at the IO interface connector is active low. It can be used to switch on or switch off the TC65 Terminal. So we need to connect the Pin ON-OFF to the GND.

So, connections will be the following :


IO interface connector front view

Verification of the supply :

Check if the LED (that indicates if the module is well supplied) works.
The LED must be flashing blue.

3.2.2 Check the communication with the terminal

The serial interface of the TC65 Terminal is intended for the communication between the GSM module and the host application. This RS-232 interface is a data and control interface

for transmitting data, AT commands and providing multiplexed channels. We will use this interface to Checked the communication

Manipulation :

Open the terminal
Enter the command at the reply must be “ok “if the communication between the module and the terminal works

Notice: the baud rate is 11500 bit/sec

3.2.3 Location of the problem

ACTION	REACTION
See if a component seems to be burnt on the supply board. Notice : if the test of power supply (step 1) does not work and the test of the communication (with the terminal) is ok, Start by checking the LED	Think about why this component has been damaged.
See if a component seems to be burnt on the main board	Think about why this component has been damaged
Replace the main electrical board of a damaged module by the main electrical board of a not damaged module. Then, test	If the damaged module works we can say that the problem is located on the main board.

Check the power supplied : - With the Multimeter check what component is linked with the Power supply (pin 24) and the GND (pin 23) on a module that works. - Perform the same test with a damaged module.	If a component that should be linked with the power supply is not, Thinks about why.

Notice: Investigations cannot be pushed further because we cannot access the schematic of the module.
The module will be returned to the supplier company, as well as the location of the problem (see test report).

3.2.4 test report

Reference	Test supply	Test communication with terminal	Finding	Location of the problem
355632008546286	OK	OK		NO PROBLEM
355632008990799	Fail	Fail		MODEM BOARD
355632008568579	Fail	Fail		MODEM BOARD
355632008989015	Fail	OK	Led burn out	SUPPLY BOARD
355632008557424	Fail	Fail		MODEM BOARD

3.3 Task 3: Test board

DESCRIPTION	DEVICE SUPPLIED	TOOLS NEEDED
This works is about created That have been created by software in the task Test board visio	wooden support AVC AOC Interior LED sign Slave flat screen switch box VS001 KVM ERIC	Crimp Crimp tool Connector Saw Ruler pencil rubber spirit level Screw Drill

3.3.1 Description of the device

Notice: The description of the AVC, the Interior LED sign, the Slave flat screen as well as the ERIC has been supplied previously on the part “1.3. Company Products”

Switch box

The structure was devised in the following manner:

- There is one switch box for the 24 v supply
- One for the odometer whose function is to generate a square signal (the frequency can be changed with a knob adjuster)
- One for the digital input to choose the digital input you want to switch off or switch on
- On for the relay output to show which relay are switched on and which are switched off

VS001

The Hancis video distribution is capable of redistributing a single VGA signal coming from a standard Hancis AVC to single and double sided TFT units for a maximum of 12 double-sided slave TFTs connected in cascade.

KVM

The KVM allows controlling two computers from (here the AVC and the AOC) keyboard, monitor and mouse.

3.3.2. How do you do the test board in three steps

Drawing

The first step is about drawing the plan that has been realized with the software Visio (see task “test board Visio”).
The measures which were previously taken by the software Visio are very useful in this step.
The drawing needs to be very precise and the position of all electrical device need to be check by a spirit level.

Fixing

The devices are fixed with self tapping screw.

Wiring

Power

Colours that were chosen are respectively blue and brown for the 0v and the 24v
The section of the wire is 0.2 mm and the strength is 16

Communication

Colours that were chosen are respectively green and violet for the Transmission and the reception
The section of the wire is 0.2 mm and the strength is 16

CONCLUSION

Thanks to the company Hanover Displays Ltd

I have seen that the field of public transport is not a negligible part of the electronic market. Indeed, public transport services have to provide security, information and the comfort for its customers.

"Hanover displays" deals with the information part providing an onboard computer on which can be connected to a display screen, a GPS antenna, the speakers etc ....

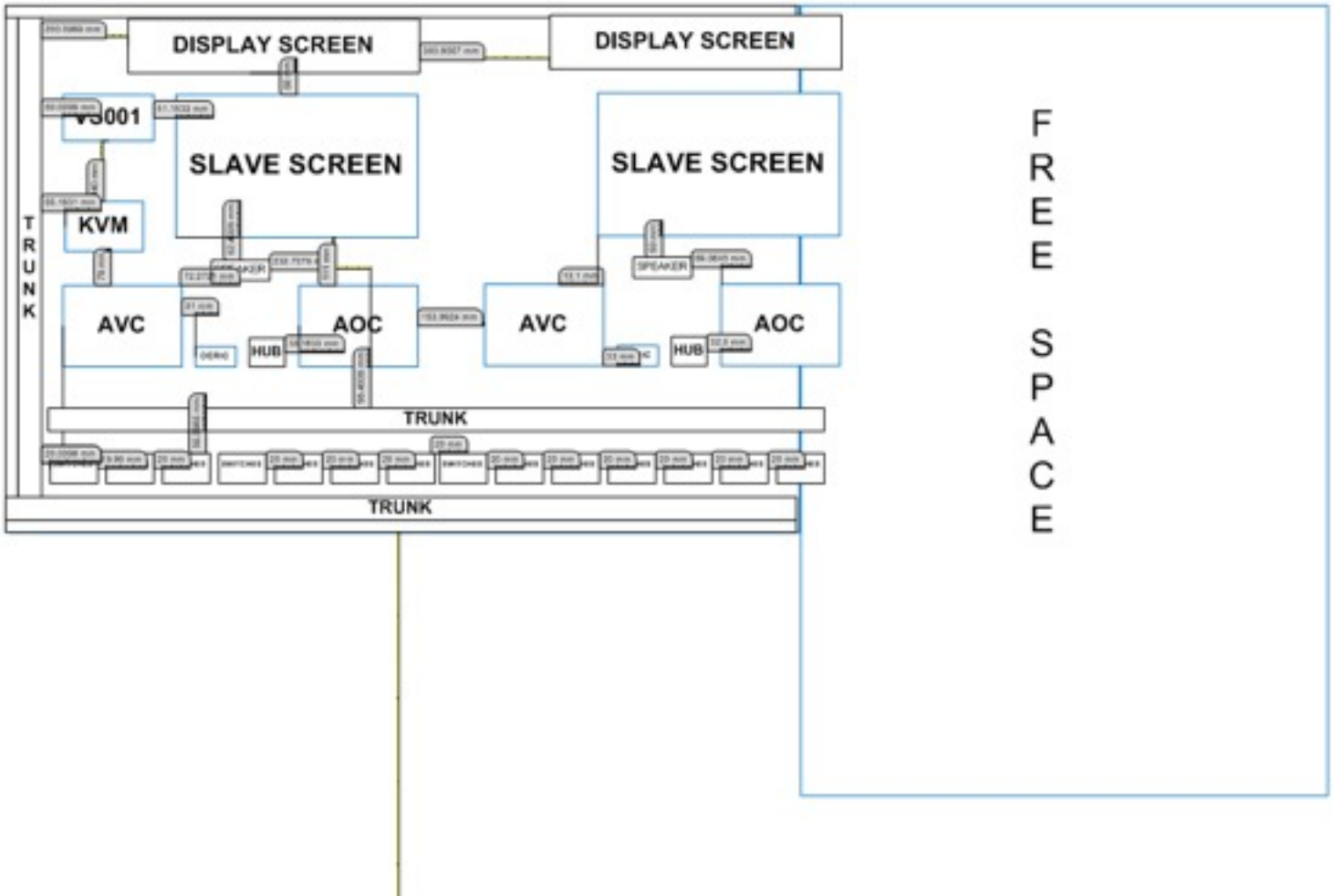
As we have seen in this report, this part requires hardware knowledge and software knowledge.

One of the objectives of this report is to be understood by a person who has no electrical or informatics knowledge but also to be useful for the company. This is the reason why each task has been explained in the simplest way as possible and some tasks contain the manipulation useful to complete the work.

This internship has been a beneficial part concerning the technical knowledge acquired but also to get to know the corporate culture. This is particularly interesting because this company is foreign to my country of origin. Without forgetting the improvement of English language, which is necessary for engineers.

APPENDIX

drawing of the test board with measure



drawing of the test board without measure

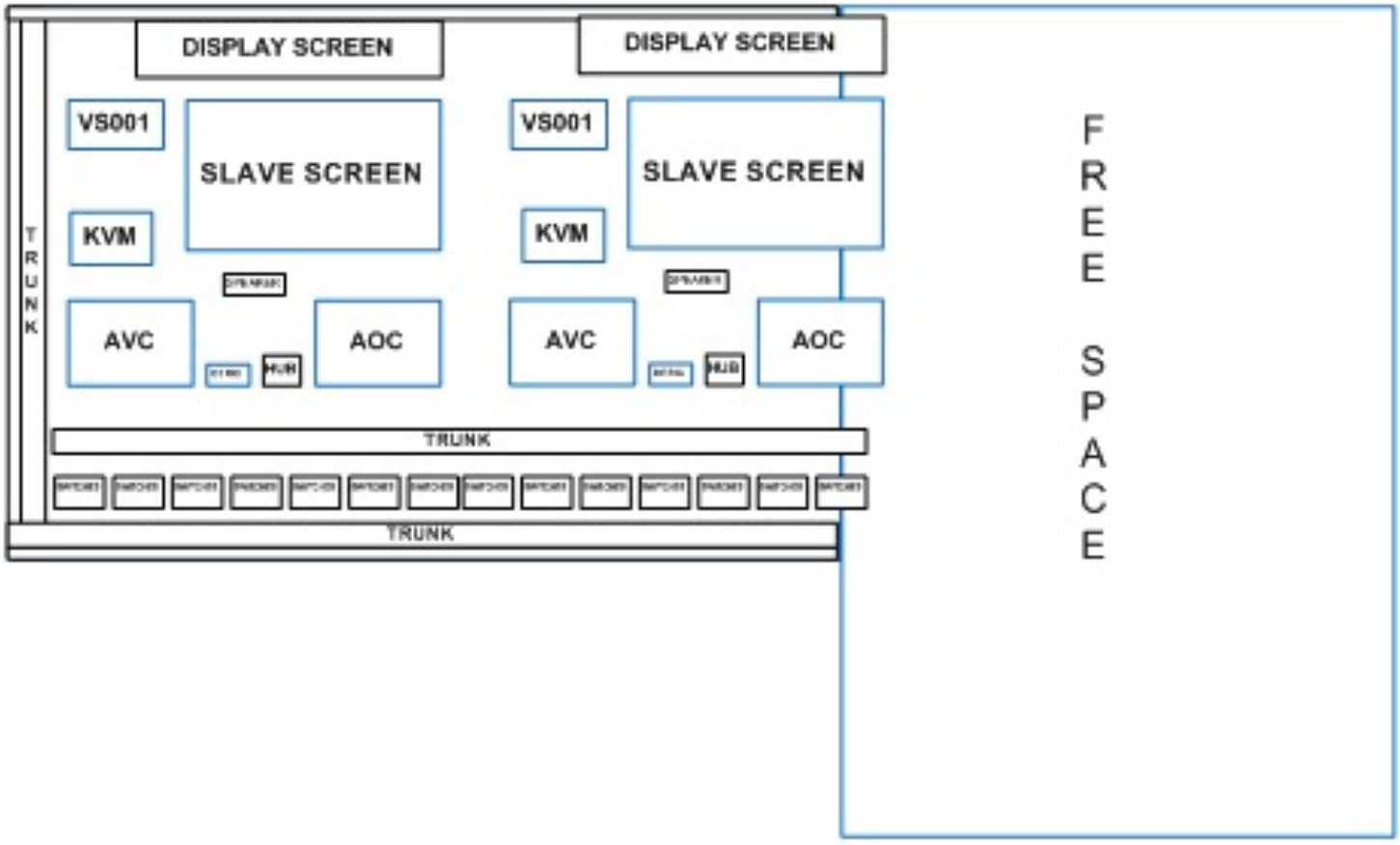
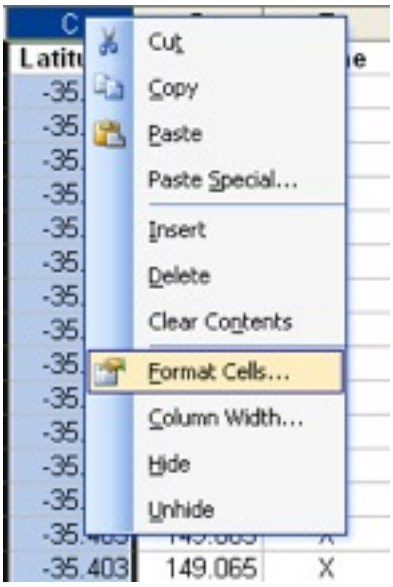


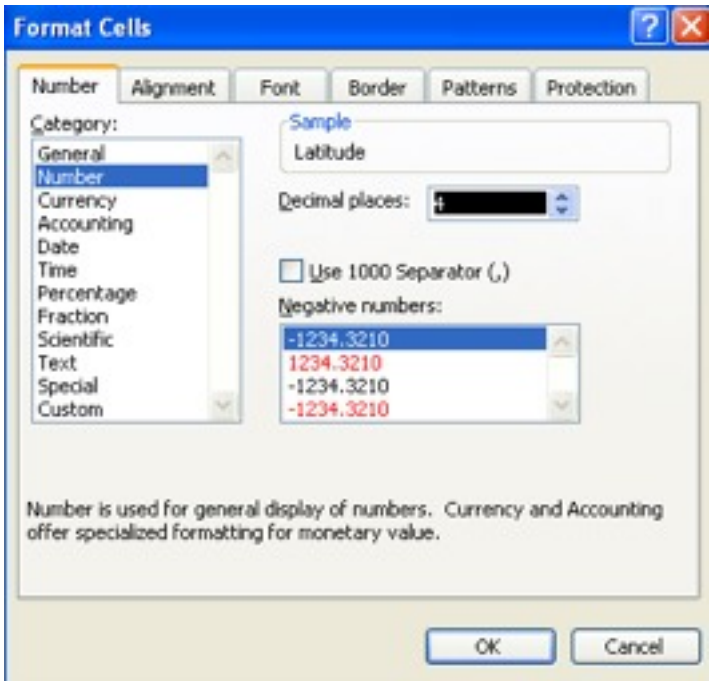
table of pin part power supply TC-65 Wireless module

Pin	Signal name	I/O	Description
1	I2CCLK_SPICLK	O	I2C or SPI Clock
2	I2CDAT_SPIDO	I/O	I2C Data or SPI Data out
3	GPIO3	I/O	Programmable GPIO
4	GPIO4	I/O	Programmable GPIO
5	GPIO5	I/O	Programmable GPIO
6	GPIO6	I/O	Programmable GPIO
7	GPIO1	I/O	Programmable GPIO
8	GPIO2	I/O	Programmable GPIO
9	ADC2_IN_P	I	Balanced analog 2 positive input
10	ADC2_IN_N	I	Balanced analog 2 negative input
11	BACKUP	I	Backup battery
12	GND		Ground for power supply
13	SPICS	O	SPI Select
14	SPIDI	I	SPI Data In
15	GPIO9	I/O	Programmable GPIO
16	GPIO10	I/O	Programmable GPIO/ Pulse counter
17	GPIO7	I/O	Programmable GPIO
18	GPIO8	I/O	Programmable GPIO
19	VDD	O	Signal supply voltage
20	ONOFF	I	Ignition
21	ADC1_IN_P	I	Balanced analog 1 positive input
22	ADC1_IN_N	I	Balanced analog 1 negative input
23	GND		Signal ground
24	POWER	I	Power supply

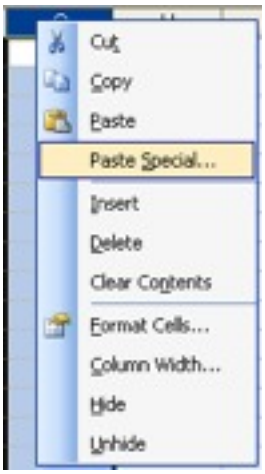
information process manipulation

step 2

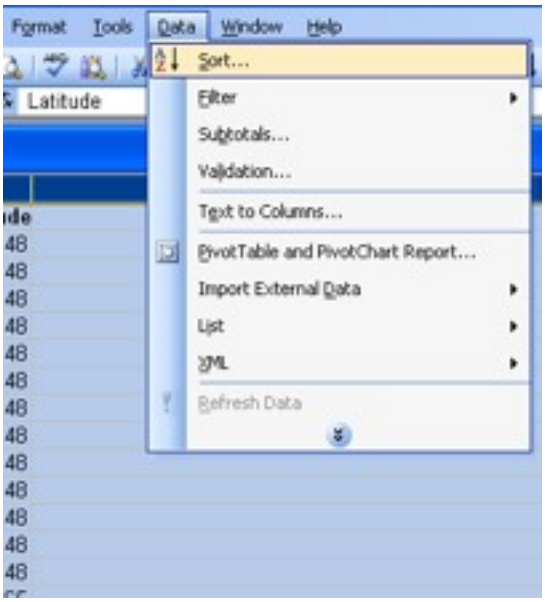




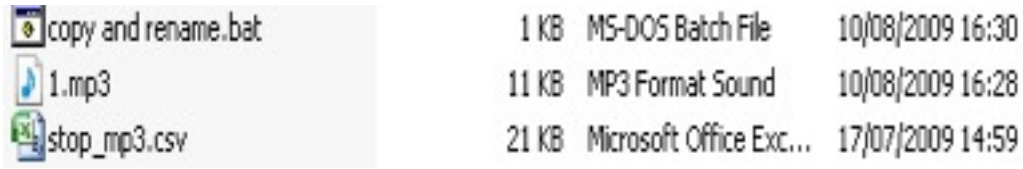
Step 4



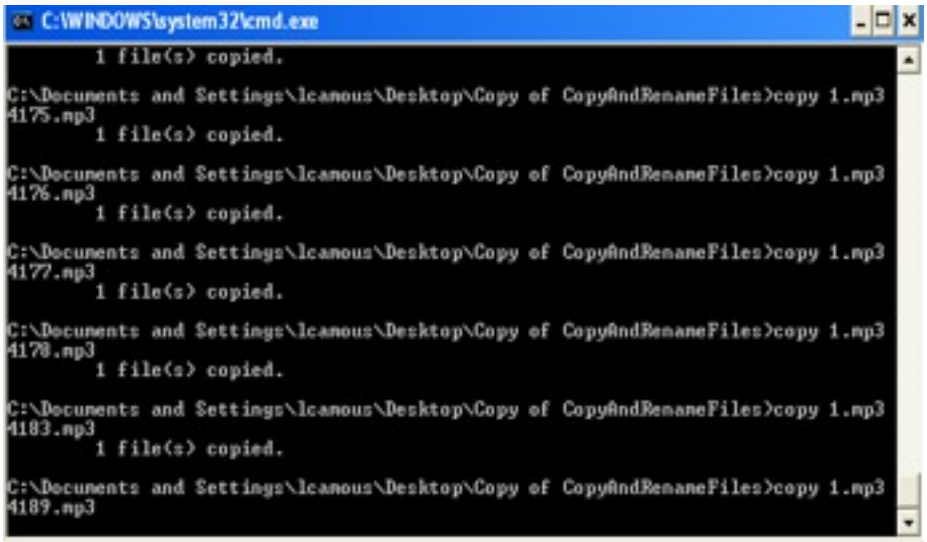
Step 5



research of a solution for the MP3 link


copy and rename.bat 1 KB MS-DOS Batch File 10/08/2009 16:30
1.mp3 11 KB MP3 Format Sound 10/08/2009 16:28
stop_mp3.csv 21 KB Microsoft Office Exc... 17/07/2009 14:59

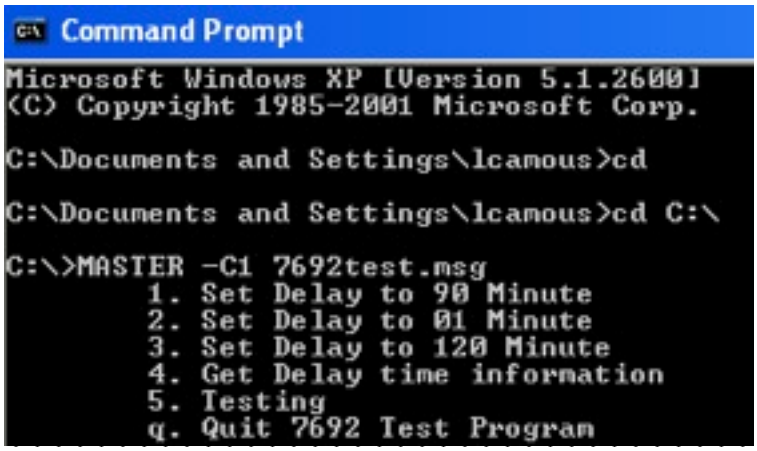
MP3 link execution 1


C:\WINDOWS\system32\cmd.exe
1 file(s) copied.
C:\Documents and Settings\lcamous\Desktop\Copy of CopyAndRenameFiles>copy 1.mp3 4175.mp3
1 file(s) copied.
C:\Documents and Settings\lcamous\Desktop\Copy of CopyAndRenameFiles>copy 1.mp3 4176.mp3
1 file(s) copied.
C:\Documents and Settings\lcamous\Desktop\Copy of CopyAndRenameFiles>copy 1.mp3 4177.mp3
1 file(s) copied.
C:\Documents and Settings\lcamous\Desktop\Copy of CopyAndRenameFiles>copy 1.mp3 4178.mp3
1 file(s) copied.
C:\Documents and Settings\lcamous\Desktop\Copy of CopyAndRenameFiles>copy 1.mp3 4183.mp3
1 file(s) copied.
C:\Documents and Settings\lcamous\Desktop\Copy of CopyAndRenameFiles>copy 1.mp3 4189.mp3

MP3 link execution 2

copy and rename.bat	1 KB	MS-DOS Batch File	10/08/2009 16:30
1.mp3	11 KB	MP3 Format Sound	10/08/2009 16:28
stop_mp3.csv	21 KB	Microsoft Office Exc...	17/07/2009 14:59
!StopID.mp3	11 KB	MP3 Format Sound	10/08/2009 16:28
1044.mp3	11 KB	MP3 Format Sound	10/08/2009 16:28
1045.mp3	11 KB	MP3 Format Sound	10/08/2009 16:28
1046.mp3	11 KB	MP3 Format Sound	10/08/2009 16:28
1047.mp3	11 KB	MP3 Format Sound	10/08/2009 16:28
1048.mp3	11 KB	MP3 Format Sound	10/08/2009 16:28
1049.mp3	11 KB	MP3 Format Sound	10/08/2009 16:28
1050.mp3	11 KB	MP3 Format Sound	10/08/2009 16:28
1051.mp3	11 KB	MP3 Format Sound	10/08/2009 16:28
1052.mp3	11 KB	MP3 Format Sound	10/08/2009 16:28
1053.mp3	11 KB	MP3 Format Sound	10/08/2009 16:28
1054.mp3	11 KB	MP3 Format Sound	10/08/2009 16:28
1055.mp3	11 KB	MP3 Format Sound	10/08/2009 16:28
1056.mp3	11 KB	MP3 Format Sound	10/08/2009 16:28
1057.mp3	11 KB	MP3 Format Sound	10/08/2009 16:28
1059.mp3	11 KB	MP3 Format Sound	10/08/2009 16:28
1061.mp3	11 KB	MP3 Format Sound	10/08/2009 16:28
1062.mp3	11 KB	MP3 Format Sound	10/08/2009 16:28

cheking the interface for the Hancis power control


Command Prompt
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.
C:\Documents and Settings\lcamous>cd
C:\Documents and Settings\lcamous>cd C:\
C:\>MASTER -C1 7692test.msg
1. Set Delay to 90 Minute
2. Set Delay to 01 Minute
3. Set Delay to 120 Minute
4. Get Delay time information
5. Testing
q. Quit 7692 Test Program

Hancis power control adjust the value for testing

7692test.msg - Notepad

File Edit Format View Help

```
!COM(1,9600,N,8,1)
!ENCODE(HANOVER)

!LABEL(start)

!MSGTIME(100)


!ECHO \t1. Set Delay to 90 Minute
!ECHO \t2. Set Delay to 01 Minute
!ECHO \t3. Set Delay to 120 Minute
!ECHO \t4. Get Delay time information
!ECHO \t5. Testing
!ECHO \tq. Quit 7692 Test Program\n\r

!ASK(Enter The Test Number,12345q,1, 2, 3, 4,5, q)

!LABEL(1)
"90S10,90"
!PAUSE
!GOTO(start)

!LABEL(2)
"90S10,01"
!PAUSE
!GOTO(start)

!LABEL(3)
"90S10,120"
!PAUSE
!GOTO(start)

!LABEL(4)
"90G10"
!GOTO(start)

!LABEL(5)
"90"
!GOTO(start)


!LABEL(q)

!END
```

Abstract

Hanover Displays Ltd is Europe's leading manufacturer of electronic destination signs for the public transport industry.
The field of public transport is not a negligible part of the electronic market.
As part of my second year engineering school, an two month internship was performed at Hanover Displays Ltd in Great Britain.
Several tasks have been realized, including software tasks and hardware tasks.

Résumé

Hanover Displays Ltd est le premier fabricant européen de panneaux de destination électroniques pour l'industrie des transports publics.
Le domaine des transports publics est une part non négligeable du marché électronique.
Dans le cadre de ma deuxième année en école d'ingénieur, un stage de deux mois est effectué à Hanover Displays Ltd en Grande-Bretagne.
Plusieurs tâches ont été réalisées, comprenant des travaux « software » et des travaux « hardware ».